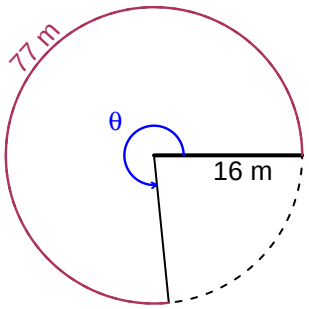
Name: Date:

Trig Final (Solution v21)

- You can use a calculator (like Desmos)
- You should have a unit-circle with special angles and coordinates marked.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 77 meters. The radius is 16 meters. What is the angle measure in radians?

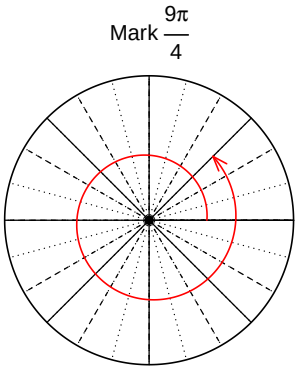


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

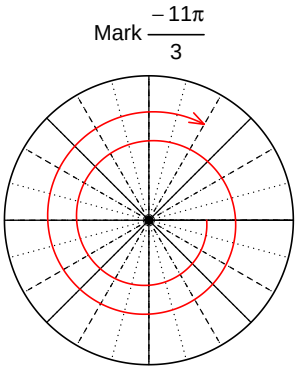
$\theta = 4.812$ radians.

Question 2

Consider angles $\frac{9\pi}{4}$ and $\frac{-11\pi}{3}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{9\pi}{4}\right)$ and $\sin\left(\frac{-11\pi}{3}\right)$ by using a unit circle (provided separately).



Find cos(9π/4)



Find sin(−11π/3)

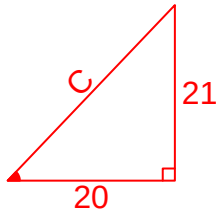
$\cos(9\pi/4) = \frac{\sqrt{2}}{2}$

$\sin(-11\pi/3) = \frac{\sqrt{3}}{2}$

Question 3

If $\tan(\theta) = \frac{-21}{20}$, and θ is in quadrant II, determine an exact value for $\sin(\theta)$.

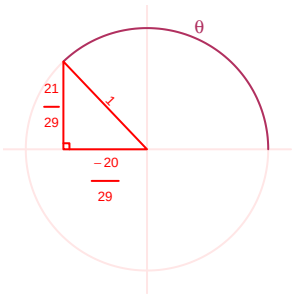
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$20^2 + 21^2 = C^2$$
$$C = \sqrt{20^2 + 21^2}$$
$$C = 29$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\sin(\theta) = \frac{21}{29}$$

Question 4

A mass-spring system oscillates vertically with an amplitude of 2.69 meters, a midline at $y = 3.73$ meters, and a frequency of 5.95 Hz. At $t = 0$, the mass is at the midline and moving down. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -2.69\sin(2\pi 5.95t) + 3.73$$

or

$$y = -2.69\sin(11.9\pi t) + 3.73$$

or

$$y = -2.69\sin(37.38t) + 3.73$$